

I claim:

1. A sound generating device comprising:
a first acoustic chamber;
a second acoustic chamber;
a plate interposed between the first and second acoustic, the plate being capable of
5 being vibrationally excited and operative to generate sound in the first and second acoustic
chambers substantially only at a resonant frequency common to both the first and second
chambers and/or harmonics of the resonant frequency, the sound in the first chamber having a
phase difference from the sound in the second chamber; and
a phase adjustment circuit for adjusting the relative phases of sound generated in the
10 first and second chambers so as to emit sound into the environmental air at approximately the
same phase.
2. A sound generating device as recited in claim 1 wherein the sound generated in the
second acoustic chamber is 180 degrees out of phase with the sound generated in the first
acoustic chamber.
3. A sound generating device as recited in claim 1 wherein the first and second acoustic
chambers are identical in their construction.
4. A sound generating device as recited in claim 1 wherein the first and second acoustic
chambers are not identical in their construction.
5. A sound generating device as recited in claim 1 wherein the phase delay circuit emits
sound generated in the first and second chambers into the environmental air in generally the
same direction.
6. A sound generating device as recited in claim 1 wherein the phase delay circuit emits
sound generated in the first and second chambers into the environmental air at generally the
same location.

7. A sound generating device as recited in claim 1 wherein the phase adjustment circuit adjusting includes a sound conduit of predetermined length and geometry.
8. A sound generating device as recited in 5, wherein the geometry of the sound conduit varies along the length of the sound conduit.
9. A sound generating device as recited in claim 5 wherein the geometry of the sound conduit diverges along the length of the conduit.
10. A sound generating device as recited in 6, wherein the geometry of the sound conduit varies along the length of the sound conduit.
11. A sound generating device as recited in claim 6 wherein the geometry of the sound conduit diverges along the length of the conduit
12. A sound generating device as recited in claim 1 wherein the phase adjustment circuit is in the shape of an axially disposed folded horn.
13. A sound generating device as recited in claim 1 wherein the phase adjustment circuit is in the shape of a spiral horn.
14. A sound generating device as recited in claim 1 wherein the phase adjustment circuit is in the shape of a conduit comprising a first radial disposed portion followed serially by a second axial portion.
15. A sound generating device as recited in claim 1 wherein the phase adjustment circuit is in the shape of an open conduit in the form of a planar surface parallel to the sound wave emergent from the second acoustic chamber and at distance from the port in the second acoustic chamber such that the sound wave is reflected to travel approximately a half wavelength of sound to the point where it merges with the sound wave generated by the first resonance chamber.
16. A sound generating device comprising:

a first acoustic chamber;

a second acoustic chamber;

a plate interposed between the first and second acoustic, the plate being capable of being vibrationally excited and operative to generate sound in the first and second acoustic chambers substantially only at a resonant frequency common to both the first and second chambers and/or harmonics of the resonant frequency, the sound in the first chamber having a phase difference from the sound in the second chamber;

at least one resonance stabilization circuit for stabilizing the resonating sound generated in the first and second chambers so as to maintain a resonant air column over a range of variably occurring conditions due to manufacturing, temperature, pressure and the like; and

a phase adjustment circuit for adjusting the relative phases of sound generated in the first and second chambers so as to emit sound into the environmental air at approximately the same phase.